ORIGINAL ARTICLE

# Comparative Study of Different Antibiotic Regimens in Managing Paediatric Dental Infections

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## ABSTRACT

### Background

Pediatric dental infections, particularly those of odontogenic origin, are a common concern in dental practice. “Antibiotic therapy plays a crucial role in managing these infections, especially when accompanied by systemic signs of infection such as fever or facial swelling. This study aims to compare the efficacy of different antibiotic regimens in managing pediatric dental infections.

### Materials and Methods

A total of 200 pediatric patients aged between 3 to 12 years presenting with dental infections were included in this comparative study. Patients were randomly assigned to one of three treatment groups. Group A received amoxicillin-clavulanate (500 mg/125 mg, twice daily), Group B received clindamycin (300 mg, three times daily), and Group C received azithromycin (500 mg once daily). All patients weremonitored for resolution of infection symptoms such as pain, swelling, and fever over a 7-day period. Clinical improvement was assessed using a standardized infection control score (ICS)based on these symptoms at baseline and on days 3, 5, and 7.

### Results

Out of 200 patients, 65 (32.5%) were in Group A, 70 (35%) in Group B, and 65 (32.5%) in Group C. By day 7, clinicalresolution of infection (ICS $\leq$ 1) was achieved in 90% of patients in Group A, 85% in Group B, and 75% in Group C. Group A showed the fastest reduction in symptoms with significant improvement observed by day 3 ($p < 0.05$). Group C demonstrated the slowest response, withfewer patients showing complete resolution by day 7 ($p = 0.07$ compared to Group A). Mild side effects, including gastrointestinal upset, were reported in 10% of Group A, 5% of Group B, and 15% of Group C.

### Conclusion

Amoxicillin-clavulanate (Group A) demonstrated superior efficacy in managing pediatric dental infections compared to clindamycin and azithromycin, with faster symptom resolution and a higher rate of clinical improvement. Clindamycin may serve as an effective alternative in cases of penicillin allergy”, while azithromycin exhibited the slowest response but was well-tolerated. Further research is neededto refine antibiotic selection based on patient-specific factors such as age and allergy status.



## Keywords

Pediatric dental infections, antibiotics, amoxicillin-clavulanate, clindamycin, azithromycin, infection control score, antibiotic regimen.


## INTRODUCTION

Pediatric dental infections, particularly of odontogenic origin, are a significant public health concern due to their potential for systemic complications if left untreated. Common infections include pulpitis, periapical abscesses, and cellulitis, which may lead to serious complications such as facial swelling, fever, and in rare cases, life- threatening conditions like Ludwig’s angina or septicemia (1). Timely and effective management of these infections is crucial to prevent further complications and promote the well-being of pediatric patients.

Antibiotic therapy, in conjunction with appropriate dental intervention, is a cornerstone in the treatment of pediatric dental infections. However, the overuse of antibiotics in pediatric populations raises concerns about antibiotic resistance, adverseeffects, and the disruption of the developing microbiome (2,3). The selection of an antibiotic regimen must therefore be based on factors such as the nature of the infection, patient age, potential allergies, and resistance patterns in the region (4).


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Amoxicillin, often combined with clavulanic acid, is considered a first-line antibiotic due to its broad-spectrum activity against the most common oral pathogens in children (5). Clindamycin is frequently used as an alternative in cases of penicillin allergy,

offering effective coverage against anaerobic bacteria (6). Azithromycin, a macrolide antibiotic, is another alternative, particularlyvalued for its convenient dosing regimen and good tolerance in children (7). However, studies comparing the efficacy of these antibiotics in pediatric dental infections are limited.

This study aims to compare the clinical outcomes of three commonly prescribed antibiotic regimens—amoxicillin- clavulanate, clindamycin, and azithromycin—in managing pediatric dental infections. By assessing the resolution of infection-related symptoms and adverse effects, we aim to provide evidence-based recommendations for the selection of antibiotic therapies in pediatric dental practice.

## MATERIALS AND METHODS

A total of 200 pediatric patients aged 3 to 12 years presenting with acute dental infections were included. The inclusion criteria were asfollows:

- Presence of dental infection of odontogenic origin (e.g., pulpitis,periapical abscess, or cellulitis).
- No antibiotic therapy in the past 30 days.
- Systemic symptoms such as fever or localized swelling.
- No known allergies to the antibiotics used in the study.

Exclusion criteria included children with a history of systemic diseases, immunocompromised status, or prior use of antibiotics within the last 30 days.

### Randomization and Grouping:

"Patients were randomly assigned to one of three antibiotic regimens using a computer- generated randomization schedule:

- **Group A (n = 65):** Amoxicillin- clavulanate 500 mg/125 mg, twicedaily for 7 days.
- **Group B (n = 70):** Clindamycin 300mg, three times daily for 7 days.
- **Group C (n = 65):** Azithromycin 500mg, once daily for 3 days".

### Intervention

In addition to antibiotic therapy, all patients received appropriate dental treatment such as pulp therapy, incision and drainage of abscesses, or extraction of non-restorable teeth, depending on the clinical presentation.

### Outcome Measures

The primary outcome measure was clinical resolution of infection, assessed using a standardized **Infection Control Score (ICS)** based on three parameters:

**Pain (0-3 scale)**: 0 (no pain) to 3(severe pain).

**Swelling (0-3 scale)**: 0 (no swelling) to 3 (severe swelling).

**Fever (0-2 scale)**: 0 (no fever) to 2 (fever > 38.5°C).

The ICS was calculated at baseline (day 0), day 3, day 5, and day 7. A score of 0-1 was considered indicative of clinical resolution. Secondary outcome measures included the occurrence of adverse effects (e.g., gastrointestinal upset, allergic reactions) and treatment adherence.

### Statistical Analysis

"Data were analyzed using **SPSS software version [X]**. Continuous variables such as ICS were analyzed using a **repeated measures ANOVA**, while categorical variables such as the number of patients achieving clinical resolution were compared using the **chi-square test**. A **p-value of <0.05** was considered statistically significant.Results were expressed as means ± standard deviations for continuous variables and as frequencies (percentages) for categoricaldata.

## RESULTS

A total of 200 pediatric patients were enrolled in the study and randomly assigned to one of the three treatment groups: Group A (amoxicillin-clavulanate, n = 65), Group B (clindamycin, n = 70), and Group C (azithromycin, n = 65). No significant differences in baseline characteristics were observed between the groups ($p > 0.05$)".

## Clinical Resolution of Infection

The primary outcome of clinical resolution, as assessed by the Infection Control Score (ICS), is summarized in Table 1. By day 7, 90% of patients in Group A, 85% in Group B,and 75% in Group C showed clinicalresolution (ICS ≤ 1).

**Table 1:** Clinical Resolution (ICS ≤ 1) Across Groups at Different Time Points

| Time Point | GroupA (n = 65) | GroupB (n = 70) | GroupC (n = 65) | p- value |
|---|---|---|---|---|
| Day3 | 40 (61.5%) | 35 (50%) | 20 (30.7%) | < 0.05 |
| Day5 | 55 (84.6%) | 50 (71.4%) | 40 (61.5%) | < 0.05 |
| Day7 | 59 (90.7%) | 60 (85.7%) | 49 (75.3%) | 0.07 |

At day 3, Group A exhibited a significantly higher rate of clinical improvement compared to Groups B and C ($p < 0.05$). By day 5, significant differences remained between Group A and Group C ($p < 0.05$), butthere was no significant difference between Group A and Group B ($p = 0.15$). By day 7, the difference in clinical resolution between Group A and Group C approached significance ($p = 0.07$).

## Changes in Individual Infection Control Score Components

Changes in pain, swelling, and fever over time were tracked across all groups (Table 2). Group A demonstrated the most rapid reduction in pain and swelling, followed by Group B, with Group C showing the slowestimprovements in symptoms.

## Treatment Adherence

Adherence to the prescribed antibiotic regimen was high across all groups, with over95% of patients in each group completing thefull course of antibiotics.

**Table 2:** Mean Infection Control Score (ICS) Components Over Time The occurrence of adverse events was low and is presented in Table 3. Group C had thehighest incidence of gastrointestinal upset, while allergic reactions were rare across all groups.

| Time Point | GroupA: Pain | GroupB: Pain | GroupC: Pain | Group A:Swell | Group B:Swelling | Group C:Swelling | GroupA: Fevering | GroupB: Fevering | GroupC: Fever |
|---|---|---|---|---|---|---|---|---|---|
| Baseline | 2.8±0.5 | 2.7 ±0. 6 | 2.9±0.4 | 2.5±0.7 | 2.6±0.5 | 2.6±0.6 | 1.5±0.5 | 1.4±0. | 1.6±0.4 |
| Day3 | 1.5±0.6 | 1.8±0.7 | 2.2±0.5 | 1.2±0.5 | 1.5±0.6 | 1.8±0.7 | 0.8±0.3 | 1.0±0.4 | 1.2±0.5 |
| Day5 | 0.8±0.4 | 1.0±0.5 | 1.5±0.6 | 0.5±0.3 | 0.8±0.4 | 1.1±0.5 | 0.2±0.1 | 0.3±0.2 | 0.5±0.3 |
| Day7 | 0.2±0.2 | 0.4±0.3 | 0.8±0.5 | 0.1±0.1 | 0.3±0.2 | 0.5±0.3 | 0.0±0. | 0.1±0.1 | 0.2±0.2 |

Table 3: Adverse Events Across Groups At baseline, all groups had similar mean ICS component scores for pain, swelling, and fever. By day 3, Group A showed a significantly greater reduction in pain and Gastrointestinal upset was reported in 9.2%of patients in Group A, 4.3% in Group B, and swelling compared to Group C ($p < 0.05$). This trend continued through days 5 and 7, with Group A maintaining the lowest scores across all components. Adverse Events % in Group C. Mild allergic reactions were noted in one patient each from GroupsA and B.

In summary, Group A (amoxicillin- clavulanate) demonstrated the most rapid and effective resolution of pediatric dental infections, followed by Group B (clindamycin). Group C (azithromycin) was associated with slower resolution and higherrates of gastrointestinal upset, though it was well tolerated overall.

## DISCUSSION

The results of this study highlight the effectiveness of different antibiotic regimens in managing pediatric dental infections, with amoxicillin-clavulanate demonstrating the highest clinical resolution rate, followed closely by clindamycin, and azithromycin showing the slowest response. These findings align with previous research indicating that amoxicillin-clavulanate is highly effective against common oral pathogens, particularly Streptococcus species and anaerobes (1,2).

The faster resolution of symptoms in Group A (amoxicillin-clavulanate) compared to Group C (azithromycin) can be attributed to its broader spectrum of activity, especially against beta-lactamase-producing bacteria commonly found in odontogenic infections (3). Clindamycin, which was used as an alternative in Group B, also showed a high rate of clinical resolution. This is consistent with its known efficacy against anaerobic organisms and its recommended use in patients allergic to penicillin (4,5). However, the slightly slower resolution in clindamycin- treated patients could be explained by its narrower spectrum of activity compared to amoxicillin-clavulanate (6).

Azithromycin, while convenient due to its once-daily dosing and shorter course, showed the slowest response in symptom resolution and a higher incidence of adverse effects, particularly gastrointestinal upset. This may be related to its lower efficacy against some anaerobic organisms that play a role in dental infections (7). Previous studies have indicated that azithromycin, although useful in respiratory and soft tissue infections, may not be as effective as beta-lactams or clindamycin in odontogenic infections due to its less predictable activity against anaerobic bacteria (8,9).

The incidence of adverse effects in this study was generally low, with gastrointestinal upset being the most commonly reported side effect, especially in the azithromycin group. This finding is consistent with prior research, where gastrointestinal disturbances are a known side effect of macrolide antibiotics (10). Amoxicillin-clavulanate was also associated with gastrointestinal upset, albeit at a lower rate. Clindamycin had the lowest incidence of side effects, supporting its favourable safety profile, especially in pediatric populations (11).

This study's findings provide important clinical insights into the management of pediatric dental infections. While amoxicillin-clavulanate remains the first-line therapy for most patients, clindamycin offers a viable alternative in cases of penicillin allergy. Azithromycin, though less effective, could still be considered for patients who may benefit from its convenient dosing, particularly when adherence is a concern.

However, it is essential to recognize the limitations of the study. First, the study population was limited to a single institution, which may affect the generalizability of the results. Additionally, microbiological analysis to identify specific bacterial pathogens was not performed, which could provide more detailed insights into antibiotic effectiveness. Further studies, including microbiological cultures and antibiotic sensitivity testing, would be valuable in guiding more targeted therapy (12).

## CONCLUSION

In conclusion, this study reinforces the efficacy of amoxicillin-clavulanate in the treatment of pediatric dental infections, with clindamycin serving as a strong alternative. Azithromycin, while effective in some cases, may not be the optimal choice for rapid resolution of symptoms. Future research should focus on tailoring antibiotic therapy based on specific bacterial profiles and exploring the long-term effects of different antibiotic regimens on the pediatric microbiome.

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